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**Disciplinary Parenting Practice and Child Mental Health: Evidence from
the UK Millennium Cohort Study**

ABSTRACT

Objective: To investigate whether a longitudinal association exists between differential disciplinary parenting practices at age 3 and later child psychopathology at age 11.

Methods: Data were obtained from the Millennium Cohort Study (MCS), a UK wide cohort. Discipline style was assessed using a validated maternal reported questionnaire at age 3, for which later outcome data were available. We distinguished between 'active' (including smacking, shouting and telling off) and 'withdrawal' approaches (including ignoring, removal of privileges and sending to bedroom). Child emotional and behavioral problems were assessed at age 3 and 11 using the maternally completed Strengths and Difficulties Questionnaire (SDQ). The independence of associations between early discipline and later child mental health were investigated using mutually adjusted regression analyses and potential reverse causality was considered by looking at changes between SDQ subscale scores from age 3 to 11.

Results: Differential associations with change in child psychopathology according to discipline type was observed. Both active and withdrawal discipline were associated with a reduction in conduct problems from ages 3 to 11 (active beta cf -0.28, 95% CI -0.34 to -0.21, $p<0.001$ and withdrawal beta cf -0.19 95% CI -0.24 to -0.14, $p<0.001$). However, active approaches were also associated with an increase in emotional problems (beta cf 0.07 95% CI 0.00 to 0.14, $p=0.03$); not observed for withdrawal approaches.

Conclusions: Different approaches to discipline appear to have differential associations with later child mental health. Further research accounting for a greater number of parent and child characteristics is needed to assess whether such associations are causal.

LAY SUMMARY

This study utilized data from the Millennium Cohort Study, a large UK based cohort following the lives of young people born in the year 2000 and their families. Specifically, this study explores the associations between maternal disciplinary parenting practices at age 3 and later child mental health at age 11. If replicated and understood, these findings may suggest that if mothers adopted more withdrawal and less active approaches then later emotional and behavioral problems might be reduced.

INTRODUCTION

Fifty percent of all life time cases of mental illness are thought to be established by age 14¹ and the majority of young people experiencing mental health problems have not had appropriate interventions at a sufficiently early age.² Crucial to childhood development is the relationship between child and care giver. Parenting receives worldwide recognition as being important to child development.³ The literature speaks primarily of 'positive' or 'negative' parenting strategies; best understood as broad approaches that if adopted are considered to result in better or worse child outcomes.^{4,5} Positive parenting appears associated with a more sensitive approach based on warmth such as that originally defined by Ainsworth⁶ and empirical evidence suggests key elements related to parental responsiveness are crucial.⁷ Negative parenting however appears more consistent with harsh or punitive approaches incorporating elements of hostility and psychological control.⁵

From a mental health perspective, there is evidence that low rates of global positive parenting⁸ and high rates of negative parenting⁹ correlate with high rates of depressive symptoms in children. Additionally, studies looking at specific positive parenting (e.g. responsiveness to distress and warmth) have found positive associations with child emotional and social functioning.¹⁰

Discipline is a key component of parenting and arguably is important for maintaining child safety and health³. Given that children displaying more challenging behavior generally evoke greater overall discipline, it is unsurprising that an association between harsh discipline and negative child outcomes exists³. Thus, understanding how children might respond to *different* forms of discipline may be of greater use. From a behavioral perspective, Skinner proposed Operant Conditioning¹¹ as a model for learning in which behaviors are changed by the presence or absence of consequences. He described two underpinning principles of reinforcement and punishment. Punishment aims to weaken or eliminate an undesirable behavior by introducing a stimulus (e.g. criticizing a child for bad behavior) or by removing a reward (e.g. not being allowed out to play with friends for bad behavior).

Within this behavioral framework, we investigate ‘punishment’ approaches to discipline and thus this paper aims to identify the potential associations between different disciplinary practices at age 3 and later child psychopathology at age 11. According to the behavioral model both positive and negative punishment should lead to a reduction of undesirable behavior in the short term, however the differential longer-term consequences are less clear. Previous studies have suggested that specific forms of negative punishment such as smacking are associated with negative child outcomes (see this overview¹²) and so we hypothesize that the emotional content (shame, guilt, fear) associated with positive punishment may lead to a longer-term exacerbation of emotional problems. We hypothesize that this may be amplified in the context of maternal depression where the emotional content may be particularly loaded. We further hypothesize that there may be differential associations with different domains of child psychopathology, and while both forms of punishment may reduce behavioral problems, it may increase emotional problems over time. Given the ambiguous use of the terms ‘positive’ and ‘negative’ in the literature and to more clearly describe the disciplinary techniques measured, we refer to positive punishment in the operant conditioning sense as ‘active’ and negative punishment as ‘withdrawal’ approaches.

METHODS

Sample

Design: Retrospective cohort study. This study used data from the UK Millennium Cohort Study (MCS). The MCS is a national longitudinal birth cohort, which has been monitoring the lives of 19,000 randomly selected children born in the UK. The MCS population is defined as all children born between 2000 and 2001, alive and living in the UK at age 9 months and eligible to receive child benefit at that age. Eligible children were identified using government child benefit records, an approach with near universal coverage.¹³ For further information regarding recruitment into the cohort please see the published cohort profiles^{13,14}. At the time of this study there had been five surveys conducted at age nine months, three, five, seven and eleven years. All data is freely accessible via the UK Data Service.

The present study explored exposure to maternal disciplinary parenting style at age 3 (second survey^{15,16}) and child psychopathology at age 11 (fifth survey¹⁷). Figure 1 provides an overview of methodology. Connelly and Platt¹³ provide an outline of the baseline cohort in terms of the number of families included (N=18,552). Of note, our starting sample was composed of natural mothers only for whom there was full data on exposure available (N=11,689). Ethical approval was sought by the MCS team for each survey. Additional approval was not required for this secondary analysis.

Measures

Exposure

Discipline style was established from a maternally reported questionnaire at age 3. The dataset contained seven items pertaining to disciplinary practice, originating from the *Conflict Tactic's Scale*¹⁸ developed initially to explore interfamilial conflict but also parent interaction with children. Mothers were asked about these items based on the child's behavior over the last six months and included "How often do you ignore/smack/shout/send to

bedroom or naughty chair/take away treats/tell off/bribe with sweets or other...when *Jack* is naughty”.

Each item had six possible responses numerically coded: never, rarely, once a month, once a week or more, daily and can't say. To better explore discipline within the behavioral framework, the items were grouped on a priori grounds to differentiate between positive punishment or active approaches (smacking, shouting and telling off) and negative punishment or withdrawal of child reward approaches to discipline (ignoring, removal of treats and sending to bedroom). Two continuous variables were created to reflect this distinction by summing up the individual items in each discipline category. A confirmatory factor analysis was undertaken which demonstrated the model fit well within the theoretical construct, with model fit indices of Root Mean Square Error Of Approximation of 0.045 and CFI of 0.977, see Kline.¹⁹ Bribe was not included in either discipline style, as it did not fit within the framework. The Cronbach alpha coefficient for active approaches was 0.66 and for withdrawal was 0.56. The correlation between withdrawal and active scores was $r=0.45$, Cronbach alpha of 0.61.

Outcome

Child psychopathology at age 11 was assessed using the Strengths and Difficulties Questionnaire (SDQ). The SDQ²⁰ is a brief screening questionnaire for psychopathology in the context of emotional and behavioral difficulties. Composed of twenty items covering emotional, conduct, hyperactivity, peer and prosocial problems these form the basis of five separate subscales or summed (excluding prosocial) to create a *Total Difficulties Score* (TDS) ranging from 0-40 points. The TDS can be used as a continuous, dimensional measure whereby greater TDS scores reflect greater psychopathology.²¹ In this study a parent reported (maternally completed) questionnaire was utilized. This was the primary outcome as the SDQ remains the most valid and clinically relevant outcome.

A child reported mood measure at age 11 was also included, relating to emotional problems. There were six items in total prefixed by, “over the past four weeks have you...” followed by “... felt happy/worried/sad/scared/angry/laughed” rated on a five point Likert scale. A continuous variable was created that reflected the sum of these individual items. The Cronbach alpha for this variable was 0.69.

Accounting for reverse causality

A measure of early child temperament was adjusted for in order to account for potential evocative effects (i.e. reverse causality) where children with more challenging behavior provoke greater overall discipline and continued poor behavior at later ages. This measure included 14 items derived from the Carey Infant Temperament scale at age 9 months^{22,23}. This scale aimed to capture the temperament of children (reported by the mother) across four areas: regularity (4 items), approach-withdrawal (3 items), adaptability (2 items) and mood (5 items). The individual items were summed to create an overall variable with Cronbach alpha coefficient of 0.65.

In addition, to isolate the specific associations of the different disciplinary punishment approaches we accounted for the possibility that higher use of either discipline type may reflect mothers using overall higher levels of any discipline. Thus when looking at specific forms of discipline we adjusted for early child temperament but also total discipline use via the creation of an 'overall discipline use' continuous variable, reflecting both active and withdrawal approaches (Cronbach alpha coefficient 0.70). The association observed with specific types of discipline, following this adjustment represents the specific contribution of the type of discipline over and above a generally higher use of any discipline.

Confounders

We considered the following factors on a priori grounds as potential confounders: maternal age, child gender, maternal depression and maternal psychosocial distress; the latter of which was assessed using a modified version of the Rutter Malaise Distress Inventory²⁴ designed to identify emotional disturbance and associated physical symptoms. From this inventory nine items were included by the originators of the MCS, and hence were available to this study. The Cronbach alpha coefficient for this item overall was 0.73. Maternal self-esteem was also adjusted for, established from a shortened, six item version of the Rosenberg Self Esteem Inventory²⁵, designed to measure perceived self-worth (Cronbach alpha in this study, 0.79). Additionally, measures for maternal ethnicity, maternal parity, maternal education and

maternal socio-economic status were also included in the final analyses (please see table 1 for descriptive detail).

Analysis plan

The primary outcome variable (maternally reported SDQ score at age 11) was continuous, hence the independence of associations between early discipline and later child mental health was investigated using linear regression analyses. Linear regressions were performed unadjusted and adjusted for the identified confounders above, and for the respective discipline type and finally an overall discipline composite score.

The original sampling method utilized a stratified and clustered design which was accounted for in the recommended way²⁶ by including stratum and cluster as covariates in both linear regression models.

Finally, in order to understand the relative maternal use of different disciplinary punishment approaches we calculated a *difference score*, reflecting the difference between the use of withdrawal approaches and active approaches. The difference score reflects mothers using relatively more withdrawal approaches in comparison to active approaches. Thus, if withdrawal is protective over later child psychopathology then a higher difference score should reduce symptoms.

RESULTS

Descriptive Results

The final analysis sample included a total of 4,732 participants. These individuals represented the main respondent all of whom were biological mothers of the child under consideration, and for whom there was complete data available on exposure, confounding and outcome variables. Table S1 (available online) outlines some of the descriptive features of the final sample including that the greatest proportion of participants were aged between 30-39 years (53.1%) and that most mothers were of a white ethnic background (94.5%). The majority of mothers in the sample did not have a history of depression (78.1%) and the highest educational achievement was having O levels/GCSE grades A-C (34.8%) typically completed at age 16 in the UK.

To identify any potential bias, we compared the final sample used in the main analysis with the missing data sample i.e. those participants missing from the final sample due to incomplete data sets, using chi squared tests for categorical variables and regression analyses for continuous variables (see table S1, available online). There were some differences including those missing tended to be younger, of lower socioeconomic status, of lower educational level and were more likely to have a male child. They were also more likely to have an infant with poorer temperament and consider themselves to be of low self-esteem and high psychosocial distress. However, each of these variables were adjusted for in the final analysis.

On comparing the use of active and withdrawal approaches as mean continuous scores, there was no clear difference overall (table 1, main text). In general, it was observed that the difference between the use of active and withdrawal approaches was greater for older and less educated mothers (i.e. higher difference scores). However older mothers used

relatively less discipline overall, whilst educated and higher socio-economic status group mothers used relatively more withdrawal than active approaches.

With regards to the amount of clinically significant psychopathology in the sample prior to final analysis, using recommended clinical cut offs for the TDS (please see the SDQ website for further information²⁷), 86% (8,995/10,411) were considered normal, 5.75% (599/10,411) considered borderline and 7.85% (817/10,411) were abnormal.

Main Results

Figure 1 demonstrates the distribution of data within the sample before and in the final analysis and demonstrates the pattern of data loss. The greatest loss in data was due to the inclusion of infant temperament; a variable composed of 14 items all of which needed answering for inclusion. The final analysis was undertaken with its inclusion and this did not introduce any bias as the sample was also checked without its inclusion and there was no major difference overall (see table S2 available online).

The final regression analysis between maternal discipline style at age 3 and the SDQ TDS outcome at age 11 is depicted in table 2. Unadjusted regressions showed an overall association of discipline on the TDS of the SDQ. Not depicted in the table for reasons of clarity, the effect of overall discipline at age 3 on TDS scores was explored by regression analysis demonstrating an association with increased scores at age 11 (beta cf: 0.95, 95% CI: 0.79 to 1.11, $p < 0.01^{**}$).

To better explore the nature of these associations we conducted additional regression analyses comparing the change in SDQ subscale scores between age 11 and age 3, as the change in TDS score alone is difficult to interpret (see table 3) because it may be driven by different subscales at different ages. For the conduct and hyperactive subscales there is evidence that active discipline approaches reduce these problem areas from age 3 to age 11. That is, for the change in conduct problems according to active discipline (beta cf -0.28, 95% CI -0.34 to -0.21, $p < 0.001$) and for hyperactivity and active discipline (beta cf -0.14, 95% CI -0.23 to -0.055 $p = 0.00$). However, withdrawal approaches also reduce conduct problems (beta cf -0.19 95% CI -0.24 to -0.14, $p < 0.001$), but not hyperactivity (beta cf -0.005 95% CI -0.089 to 0.079 $p = 0.91$). A different pattern is seen for change in emotional and prosocial subscales.

Active discipline is associated with increased emotional problems (beta cf 0.07 95% CI 0.00 to 0.14, $p=0.03$), whereas withdrawal discipline is not (beta cf 0.04 95% CI -0.02 to 0.10 $p=0.24$). In addition, active discipline reduced prosocial behavior (beta cf -0.16 95% CI -0.23 to -0.09, $p<0.001$) whereas withdrawal discipline did not (beta cf -0.06, 95% CI -0.126 to 0.001, $p=0.055$).

The primary analysis was also repeated with the child reported mood variable, reflecting emotional problems at age 11. Both active and withdrawal approaches were associated with higher child reported emotional symptoms, for active (beta cf 0.13 95% CI 0.04 to 0.22 $p=0.004$) and withdrawal (beta cf 0.19 95% CI 0.09 to 0.28 $p=0.001$).

Finally, we generated an interaction term between maternal psychosocial distress and both types of discipline. There was evidence for an interaction term between maternal distress and active discipline, (beta cf -0.4, 95% CI -0.72 to -0.08, $p=0.015$), but no evidence for an interaction between maternal distress and withdrawal discipline (beta cf -0.183 95% CI -0.49 to 0.12). The interaction between maternal distress and active discipline was explained by a stronger association between active discipline and child SDQ in mothers with high distress (top 50% of scores) (beta cf 1.04 95% CI 0.822 to 1.25, $p<0.001$) than in mothers with low distress (beta cf 0.64 95% CI 0.41 to 0.88 $p<0.001$). We also looked for evidence of differences according to child gender, but none were found.

Difference score

As previously described to explore these findings further a difference score was created (the difference between use of withdrawal of child reward approaches and active approaches); where a higher difference score reflected relatively more withdrawal use. We found that a 1-point increase in the relative use of withdrawal techniques was associated with a 0.07 reduction in the Total Difficulties Score (beta: -0.07, 95% CI -0.13 to -0.02, $p<0.05^*$) consistent with the finding that relatively greater use of withdrawal techniques were associated with reduced mental health problems at age 11.

Discussion

In this large cohort, we found that different approaches to discipline are differentially associated with maternal reported child psychopathology. Specifically, while both active and withdrawal discipline were associated with increased psychopathology at age 11, this may have been driven by reverse causality by children with emotional and behavioral problems evoking discipline. Indeed, when looking at changes in psychopathology from 3 to 11 years a very different pattern is seen. We found evidence that active discipline approaches appeared to reduce psychopathology on the conduct and hyperactivity subscales between age 3-11.

While withdrawal approaches also appeared to reduce conduct problems they did not reduce hyperactivity scores. This further suggests that higher discipline is likely to be evoked by more difficult children. In contrast, a different pattern was seen for emotional and prosocial subscales. Active discipline approaches were associated with an increase in emotional problems and a reduction in prosocial behaviors, whereas withdrawal approaches were not associated with a change in emotional symptoms or prosocial behavior. These associations were independent of confounding variables and mutually adjusted for the other type of discipline, early child temperament, maternal age, maternal depression and self-esteem, maternal education, parity, child gender and socio-economic status.

These results if found to be causal, could suggest that while active discipline may reduce behavioral problems they could increase emotional problems and reduce pro-social behavior later in childhood. In contrast, withdrawal approaches also reduce conduct problems but do not increase emotional problems or reduce prosocial behavior. While our primary outcome was parent reported we also included a child reported mood variable which reflected emotional problems only. Interestingly both withdrawal and active approaches were associated

with increased child reported emotional symptoms suggesting that while withdrawal approaches are not associated with emotional problems as reported by the parent they may influence the child's mood.

We also considered potential interactions, and hypothesized that active discipline techniques may be particularly problematic in the context of maternal depression as the mother's emotional tone may further heighten the emotional reaction to active discipline. We found evidence for an interaction between maternal distress and active discipline but not with withdrawal discipline. Indeed, the interaction between maternal distress and active discipline was explained by a stronger association between active discipline and child SDQ in mothers with high distress suggesting that it may be particularly problematic for children if mothers with psychosocial distress take active discipline approaches.

Strengths of this study include the longitudinal design which enabled long term follow up, adjustment for early risk factors, the large sample size and exploration of the discipline construct in two areas enabled novel findings. Limitations include maternal disciplinary practice and primary outcome for child psychopathology were assessed by parent report alone raising the possibility of information bias making it difficult to draw firm conclusions. In addition, we only assessed the associations with maternal discipline due to a lack of data on fathers in the dataset. Discipline was measured using a few self-report items with relatively low internal reliability. The lower alphas are not surprising given the small number of items and the fact that the items were grouped together as types of discipline sharing similar underlying methods (i.e., active or withdrawal). However, we acknowledge that lower internal reliability reflects some measurement error, though this would be similar across both the active and withdrawal discipline scales so would not explain differential associations. While it is not possible to exclude the possibility of residual confounding, important confounding factors were accounted for in the analyses. Notwithstanding, we did not take account of the potential effects of genetic confounding (i.e. parenting style and child behavioral outcomes reflecting shared genotype) and there was no measure to adjust for parent antisocial behavior or family abuse or trauma and these important characteristics should be explored in future studies . Finally, there was some missing data however this was unlikely to have impacted on the findings as we adjusted for all variables for which there was evidence of differences between complete and

missing samples. While it seems likely that those with missing data are more likely to show both difficult parenting relationships and more child emotional and behavioral problems, this may suggest that those most likely to show a positive association between discipline and high SDQ scores may have dropped out resulting in an underestimate of the size of associations observed.

The finding of active punishment approaches and poorer child mental health at a later age is consistent with existing literature and importantly extends the literature to a population level. Originating from work pertaining to studies exploring child maltreatment in the context of abuse, the literature now demonstrates associations between active or harsher parenting practices and later aggression and antisocial behaviors¹². Other studies have reported associations between active punishment approaches in childhood and later adult emotional outcomes including depression, anxiety, alcohol abuse^{28,29} though further studies are lacking. From a child outcome perspective, the majority of literature has focused on behavioral rather than emotional symptoms³⁰ and far fewer studies have explored the consequences of withdrawal punishment approaches specifically. To our knowledge such withdrawal approaches have only been studied in combination with other 'positive parenting' practices,³¹ making it difficult to establish individual associations. While links between exposure and outcome are made the underlying mechanisms remain largely unknown, and we cannot draw causal conclusions, some informed speculation is possible.

Skinner¹¹ described behaviors being changed by the presence or absence of consequences. While practical from a short-term parenting perspective, the longer-term associations are less understood. Perhaps of greater relevance is the concept of attachment. Bowlby's³² Attachment Theory suggests infants and children learn to adapt their attachment behavior based on their perceptions of maternal responsiveness and sensitivity producing secure or insecure infant attachments. The painful nature of active punishment approaches in the context of discipline may evoke feelings of fear, anxiety and anger. If generalized to the parent, then the disruptive implication on the parent-child relationship is understandable. In contrast the muted nature of withdrawal approaches are perhaps less likely to result in disruption of the parent-child bond, producing better child mental health outcomes.

A number of studies have also demonstrated an association between parenting and child emotion regulation^{5,34}. It is possible that harsher discipline approaches are more likely to result in poorer child emotion regulation development. Less clear is the potential associations with withdrawal approaches specifically. One possibility is that withdrawal approaches encourage the child to reflect and self-soothe aiding their own emotion regulation development, however exploratory studies are needed.

Parenting is a heterogeneous construct and understanding its specific components is important for the development of focused parenting interventions targeting identified problem behaviors; but also for the development of parenting programs at population level with a focus on early prevention rather than later treatment. This study demonstrates that for those mother-child dyads where discipline is frequent, the type of approach used appears important with distinct later childhood mental health outcome. If replicated, understood and the limitations of this study addressed, this may suggest that if mothers adopted more withdrawal and less active approaches then later emotional and behavioral problems might potentially be reduced.

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Table 1. Exploring the use of Active and Withdrawal approaches as per socio-demographic factor. Values reflect the mean continuous score and values in brackets reflect the standard deviation.

Socio-Demographic Factor		Active	Withdrawal	Mean Difference
Maternal Age	Youngest (12-19 years)	9.43 (2.62)	8.61 (3.10)	0.82
	Young (20-29 years)	9.53 (2.46)	8.40 (2.86)	1.13
	Middle (30-39 years)	9.23 (2.32)	7.95 (2.76)	1.28
	Old (40 years plus)	8.60 (2.30)	6.85 (2.47)	1.75
Maternal Education	Higher Degree	9.01 (2.23)	8.32 (2.55)	0.62
	First Degree	9.22 (2.10)	8.38 (2.63)	0.84
	Diplomas in higher education	9.47 (2.35)	8.31 (2.76)	1.16
	A/AS/S levels	9.52 (2.24)	8.58 (2.68)	0.94
	O level/ GCSE grades A-C	9.47 (2.39)	8.10 (2.83)	1.37
	GCSE grades D-G	9.33 (2.55)	7.93 (2.94)	1.4
	Other academic qualifications	9.02 (2.62)	7.72 (2.97)	1.3
	None of these qualifications	9.06 (2.71)	7.61 (3.06)	1.45
Maternal Depression	No	9.28 (2.38)	8.04 (2.80)	1.24
	Yes	9.53 (2.44)	8.39 (2.90)	1.14
Child gender	Boy	9.55 (2.40)	8.36 (2.83)	1.19
	Girl	9.12 (2.38)	7.89 (2.81)	1.23
Maternal Parity	No other baby	8.52 (2.31)	7.51 (3.02)	1.01
	Yes other babies	9.35 (2.40)	8.13 (2.83)	1.22
Maternal socioeconomic status (from high to low)	Managerial and Professional	9.30 (2.20)	8.28 (2.64)	1.02
	Intermediate	9.52 (2.31)	8.18 (2.79)	1.34

	Small employers and self employed	9.33 (2.39)	7.86 (2.77)	1.47
	Lower supervisory and technical occupations	9.45 (2.39)	8.28 (2.87)	1.17
	Semi routine and Routine	9.35 (2.53)	8.03 (2.94)	1.32
	Low	9.52 (2.37)	8.26 (2.84)	1.26

Table 1 Notes: *Maternal education* descriptors include (i) no qualifications (ii) other qualifications outside of the specified categories (iii) GCSE grades D-G and GCSE grades A-C (GCSE stands for General Certificate of Secondary Education, a national qualification completed by students aged 14-16 years.) (iv) A/AS level (stands for General Certificate of Education Advanced level, completed between age 16-18 years and is the main national school leaving qualification) (v) Diplomas in higher education (a qualification in higher study beyond school but not meeting the criteria for an undergraduate or bachelor's degree) (vi) First degree (higher qualification obtained from university usually at undergraduate level) (vii) Higher degree (additional university based qualifications obtained after the first degree).

Socioeconomic status descriptors were derived from the UK National Statistics Socio-economic Classification, five classes system based on main respondent's current job available online³⁵.

Maternal self-esteem descriptors (i) Low relates to overall poor/low self-worth (ii) High relates to overall better/high self-worth. Derived from the Rosenberg Self Esteem Inventory, see main text for further details.

Infant temperament descriptors (i) High relates to easy or better temperament (ii) Low relates to difficult or poor temperament. This measure was obtained from the Carey Infant Temperament scale in which 14 questions were used to assess the temperament of the child, see main text for further information.

Maternal psychological distress descriptors (i) Low relates to low levels of distress (ii) High relates to high levels of distress. This measure was derived from the Rutter Malaise Inventory, see main text for further details.

Table 2. Linear Regression Analysis to demonstrate relationship between discipline style at age 3 and the TDS of the parent rated SDQ at age 11

	Model 1 (n= 4,732) Unadjusted			Model 2 (n=4,749) Adjusted		
	Beta	P value	95% CI	Beta	P value	95% CI
Active Punishment	1.11	<0.01**	0.93, 1.28	0.72	<0.01**	0.53, 0.90
Withdrawal of Child Rewards	0.84	<0.01**	0.67, 1.00	0.41	<0.01**	0.24, 0.58
<p>Table 2 notes: Model 2 includes co-adjustment for active and withdrawal discipline, early child temperament, maternal age, maternal depression, maternal self-esteem, maternal psychosocial distress (Rutter distress inventory), maternal education, maternal parity, child gender and socioeconomic status.</p> <p>Abbreviations: TDS, Total Difficulties Score; SDQ, Strengths and Difficulties Questionnaire; CI, confidence interval</p>						

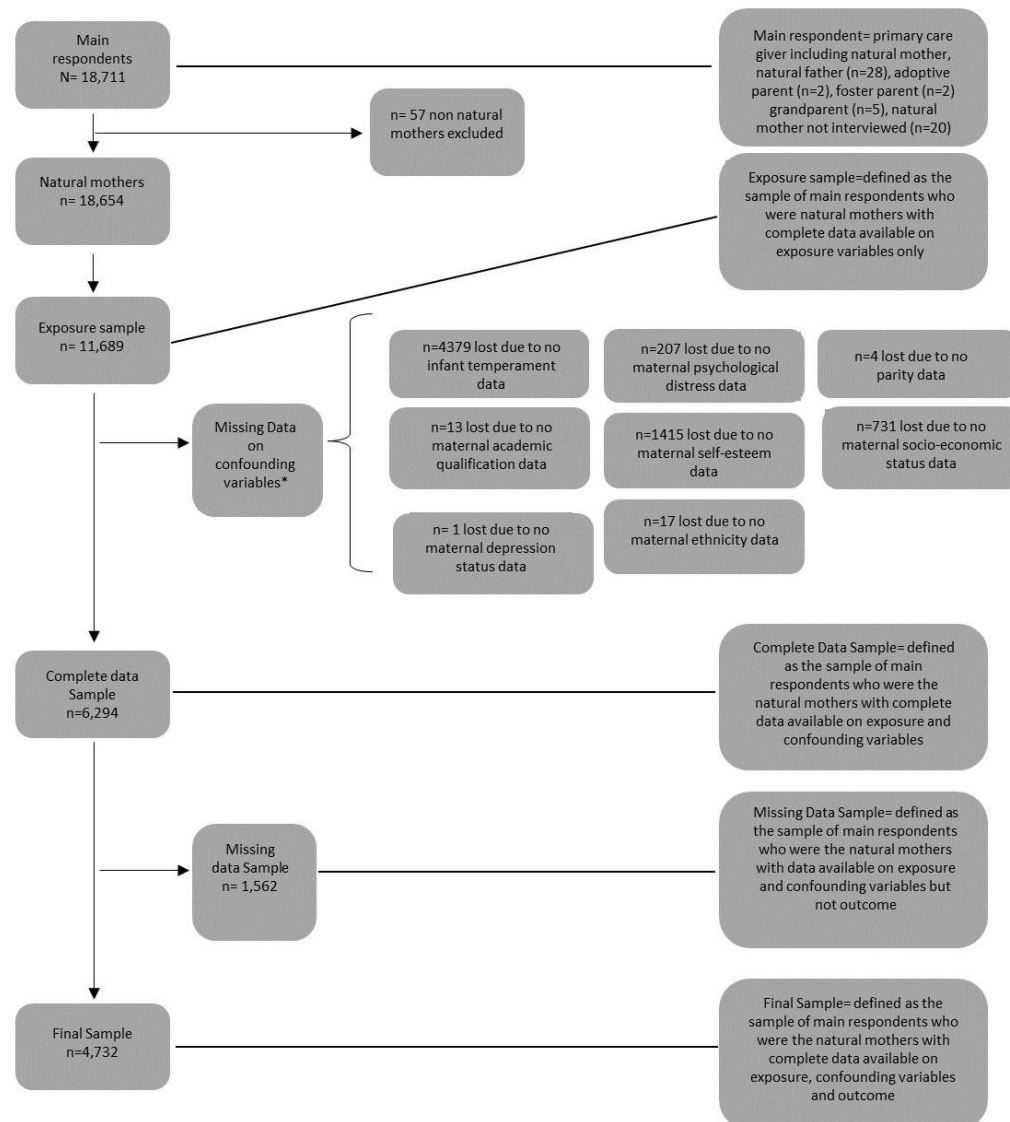
Table 3. Linear regression analyses to demonstrate the relationship between active and withdrawal discipline and the change in SDQ subscale scores between age 11 and age 3

	Change in Conduct Subscale			Change in Hyperactivity Subscale			Change in Emotional Subscale			Change in Prosocial Subscale			Change in Peer Subscale		
	Beta	P value	95% CI	Beta	P value	95% CI	Beta	P value	95% CI	Beta	P value	95% CI	Beta	P value	95% CI
Active Punishment	-0.28	<0.001***	-0.34, -0.21	-0.14	0.001***	-0.23, -0.055	0.07	<0.05**	0.0, 0.14	-0.16	<0.001***	-0.23 to -0.09	0.01	0.72	-0.05, 0.07
Withdrawal of Child Rewards	-0.19	<0.001***	-0.24, -0.14	-0.01	0.91	-0.09, 0.08	0.04	0.24	-0.02, 0.1	-0.06	0.06	-0.13, 0.00	0.05	0.10	-0.01, 0.11

Figure 1. Outline of study methodology and sample acquisition. Definitions of each sample are included within the figure.

Figure 1 notes: *The missing data does not add up to provide the difference between the Exposure sample and Complete Data Sample, as some people were missing on more than one variable. The largest amount of data lost was due to the inclusion of the infant temperament variable. This was because not every item comprising the temperament variable was answered by all the main respondents. Completing the final analysis with and without infant temperament included did not make any significant difference.

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